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26 February 2002

EPA Region 5 Records Ctr.



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Mr. Scott Hansen, SR-6J  
Work Assignment Manager  
U.S. Environmental Protection Agency  
77 West Jackson Boulevard  
Chicago, Illinois 60604-3590

U.S. EPA Contract No.: 68-W7-0026  
Work Assignment No.: 114-RXBF-0573  
Document Control No.: RFW114-2B-AKQF

Re: Review comments on 1 September 1992 Letter from Woodward-Clyde, Skinner Landfill,  
West Chester, Ohio

Dear Mr. Hansen:

Roy F. Weston, Inc. (WESTON®) is pleased to submit the review comments for the Manganese Occurrence in Soil and Water Letter prepared by Woodward-Clyde for the Skinner Landfill, West Chester, Ohio. The review comments are provided below.

The basic summary and conclusions of the report can be described as below:

1. Manganese is a contaminant of concern (COC) in groundwater and surface water.
2. Manganese is at background levels in soil and sediment.
3. Potassium permanganate ( $\text{KMnO}_4$ ) will produce oxidizing conditions and form insoluble manganese minerals.
4. Organic material in the landfill produces reducing conditions, resulting in soluble manganese minerals.
5. Manganese in groundwater and surface water may be due to natural subsurface material as well as material in the landfill itself.
6. Manganese contributes 1% of the noncancer hazard index (HI) for groundwater ingestion.
7.  $\text{KMnO}_4$  is only one of the possible sources of manganese in the landfill environment.

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Mr. Scott Hansen  
U.S. EPA

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8. Mobilization of manganese is possibly due to organic wastes that are affecting subsurface redox conditions.

The report suggests that manganese does not pose a health risk. However, the report does not indicate whether the individual noncancer HI for manganese is greater than 1 or whether the manganese has the same endpoint as other risk drivers. If either condition is true, manganese does pose a human health risk.

The report suggests that manganese in soil and sediment is at background levels. Based on the range of data presented, manganese appears to be elevated above background at least in discrete locations. Are any of the background locations near where  $\text{KMnO}_4$  was disposed?

Injection of  $\text{KMnO}_4$  has been tested in the Department of Energy pilot studies as a remediation technique for organic contaminants (e.g., trichloroethene [TCE]) in soil and groundwater (*In Situ Chemical Oxidation Using  $\text{KMnO}_4$* , DOE/EM-0496, September 1999 <http://apps.em.doe.gov/ost/pubs/itsrs/itsr167.pdf>). Permanganate is used to break down TCE into carbon dioxide, manganese dioxide, chloride, potassium, and hydrochloric acid. Note that the pilot study did not quantify potential impacts on human health and the environment though it suggests that the levels are not of concern. Thus, permanganate may have aided in the remediation of organic contaminants at this site.

Permanganate is a strong oxidizer, and though manganese may not be of concern from a risk perspective, redox-sensitive metals may have been mobilized under the highly oxidized conditions it produced.

One potential way to determine if the potassium manganese has contributed to concentrations above background is to perform a mass balance analysis. This can be performed by knowing the amount of potassium permanganate deposited in the landfill versus the amount of manganese in the groundwater and the amount above the background range. If the amount of manganese potentially contributed by the permanganate is less than the amount in excess of background levels, then the increase is due to increased mobilization of naturally occurring manganese. This approach, of course, depends upon whether or not the data exist to make such a determination.



Mr. Scott Hansen  
U.S. EPA

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Should you have any questions or require additional information, please feel free to contact me at (847) 918-4051.

Very truly yours,

ROY F. WESTON, INC.

A handwritten signature in black ink, appearing to read "Omprakash S. Patel".

Omprakash S. Patel.

Site Manager